

MHSS 2020 FOCUSED STUDY ON BIOTECHNOLOGY & NANOTECHNOLOGY, 29 JULY 1997

Proponent

The proponent for this document is the Department of Defense (Health Affairs).

Web Site Location

This document is accessible from the MHS 2020 homepage at <http://keydet.sra.com/hs2020/homepage/hs2020.htm>. The document may be reviewed in the USACHPPM Plans and Integration Office.

Definition

Biotechnology- The application of biological systems and organisms to technical and industrial processes. Production may be carried out by using intact organisms, such as yeasts and bacteria, by using natural substances (i.e. enzymes) from organisms, or by modifying the genetic structure of organisms.

Nanotechnology (Nanomachine) - Functional machine systems on the scale of nanometers, or billionths of a meter. Some prefer to reserve the term for machine systems based on "assemblers", nano-scale robot arms that can assemble things atom by atom. Others prefer a broader definition: any construction of molecular structures large and complex enough to function as machines or devices.

Synopsis

This document is a product of MHS 2020. MHS 2020 is a project of the Military Health System (MHS) which envisions potential future conditions to enable today's MHS decision makers to make the best possible policy and resource decisions. This focused study on biotechnology and nanotechnology has two primary goals:

- ◆ examine the future strategic impact of biotechnology and nanotechnology as it relates to the military health system, and;
- ◆ develop a set of strategic recommendations related to biotechnology and nanotechnology for consideration by the senior leadership of the MHS.

The study presents forecasts addressing potential impacts of biotechnology on disease detection and diagnosis, treatment and prevention, agriculture and environmental technologies, nanotechnology and other areas of military significance.

Examples of forecasts of the impact of biotechnology and nanotechnology that *directly* affect health include:

- ◆ disease detection and diagnosis: Commercial production of inexpensive, hand-held biosensors to detect disease; development of biosensors which will eliminate the need for facility infrastructure such as laboratories; development of gene chips for analyzing the



Report Documentation Page		
Report Date Aug 1998	Report Type N/A	Dates Covered (from... to) -
Title and Subtitle MHSS 2020 Focused Study on Biotechnology & Nanotechnology, 29 July 1997	Contract Number	
	Grant Number	
	Program Element Number	
Author(s)	Project Number	
	Task Number	
	Work Unit Number	
Performing Organization Name(s) and Address(es) U.S. Army AMEDD Center and School Fort Sam Houston, TX 78234	Performing Organization Report Number	
Sponsoring/Monitoring Agency Name(s) and Address(es)	Sponsor/Monitor's Acronym(s)	
	Sponsor/Monitor's Report Number(s)	
Distribution/Availability Statement Approved for public release, distribution unlimited		
Supplementary Notes		
Abstract		
Subject Terms		
Report Classification unclassified	Classification of this page unclassified	
Classification of Abstract unclassified	Limitation of Abstract UU	
Number of Pages 3		

distinctive pattern of genes active in different diseases and for individual genetic profiling;

- ◆ treatment: tailoring of therapies to individual biochemistry; development of new generations of antibiotics to address resistant bacteria; gene therapy development; expansion of immunotherapy treatment; and
- ◆ prevention: development of DNA vaccines.

Examples of forecasts of the impact of biotechnology and nanotechnology that *indirectly* affect health include:

- ◆ agriculture and environmental technologies: development of an advanced sustainable agriculture capable of increasing food production; increase in production of agricultural products enhancing health and treating disease; development of superior technologies for environmental activities such as environmental monitoring, waste treatment, ecological restoration, fuel production, and water purification.
- ◆ nanotechnology: development of programmable immune machines that travel through the bloodstream, supplementing the natural immune system, cell repair machines to perform genetic surgery.
- ◆ other areas of military significance: the use of biotechnology to develop biological weapons for terrorism; tissue engineering for use in artificial skin products and blood products; development of engineering techniques to improve human performance.

These developments will support the health paradigm change currently underway to include: emphasis on disease prevention, health promotion, and the preventable morbidity caused by lifestyle, poverty, and environmental insults; plus a focus on creating healthy communities and workplaces as well as healthy individuals;

Recommendations of this study include:

- ◆ Integration and technology monitoring: monitor biosensor developments, monitor and develop naked DNA and phage vaccines, monitor the biotechnology industry, monitor nutraceutical development, explore human performance enhancement, support a National Clearinghouse on Nanotechnology.
- ◆ Policy and training initiatives: establish a formal process for bioethics, establish a Technology Communications Group, conduct a Joint Vanguard 97/98, conduct a joint DARPA (Defense Advanced Research Projects Agency)/MHSS conference.

What Does This Mean for Military Public Health?

- ◆ we must be aware of new technologies on the horizon, and then evaluate and optimize the use of applicable new technologies to address current and future preventive medicine issues;
- ◆ we must develop better monitoring mechanisms for health;
- ◆ preventive medicine need to work with the research and development community; and
- ◆ we must leverage technology in addressing preventive medicine problems/issues.

The following is a theme common to other documents on our list.

- ◆ we need to work closely with the research, development, and acquisition communities. We must assist the Army Medical Department (AMEDD) Center and School and other service schools in developing solutions to address lessons learned and doctrine, training,

leader development, organization, materiel, and soldiers (DTLOMS) deficiencies to meet the challenges of Joint Vision 2010.